



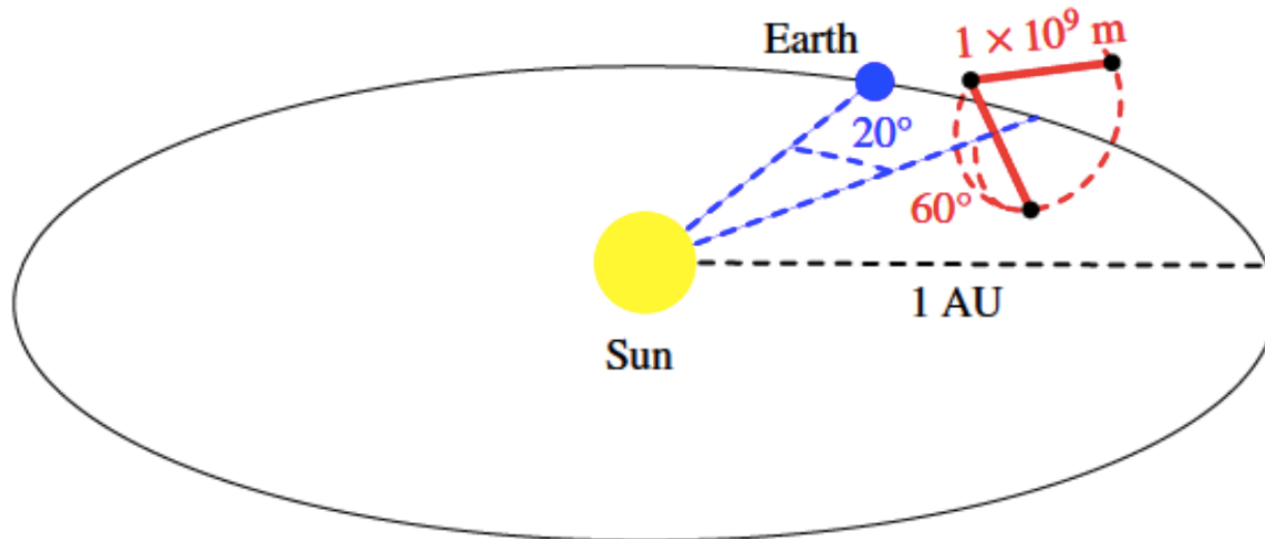
# Data analysis of an electro-optical simulator and contribution to eLISA system studies

---

*Matthieu Laporte*  
*Supervisor: Hubert Halloin*

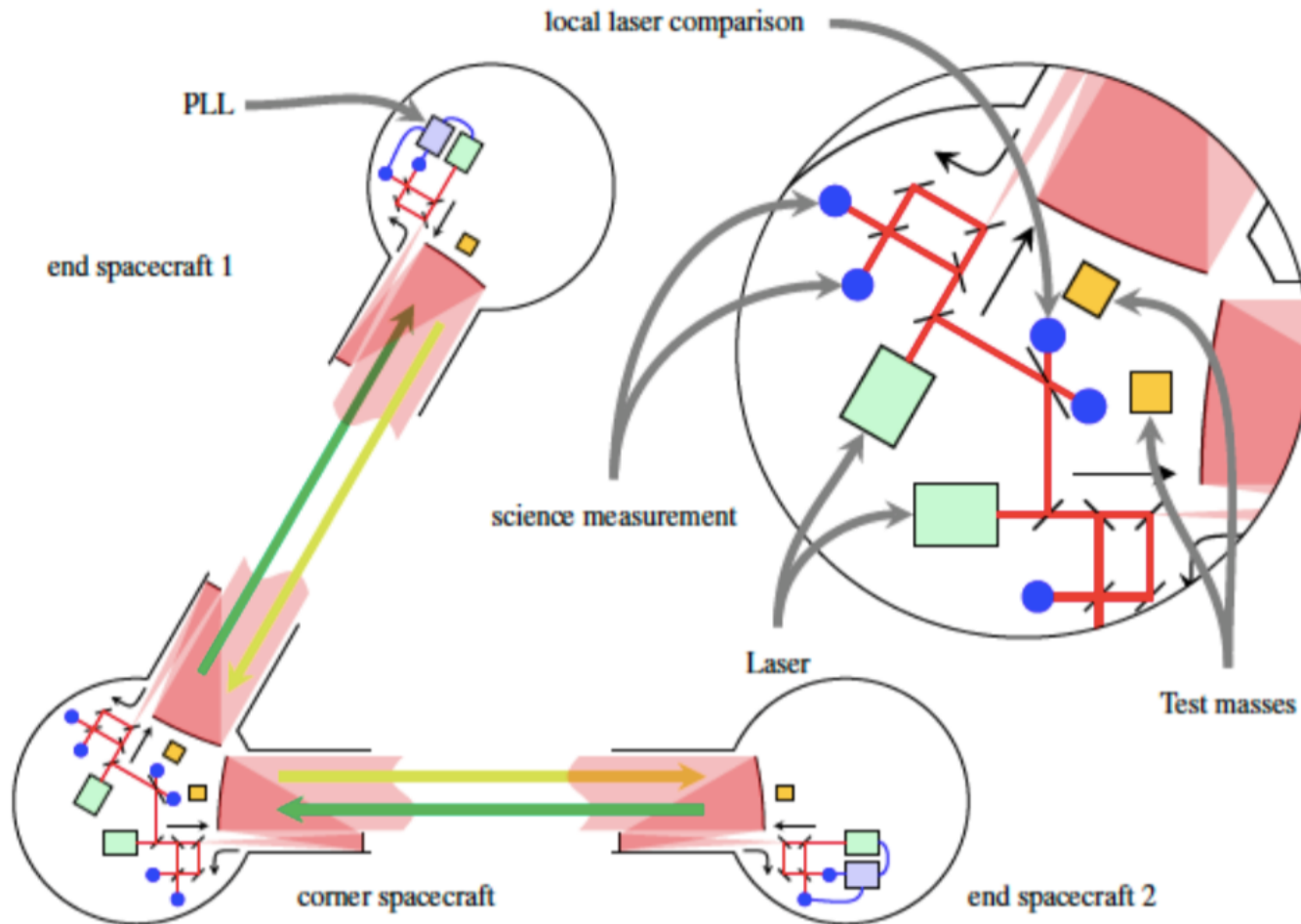
# LISA

- Mentioned in the 90s, launch in 2034 (?), ESA-(NASA) mission.
- Three satellites separated by  $10^6$  km (?), forming an equilateral triangle.
- Orbital configuration:



## LISA

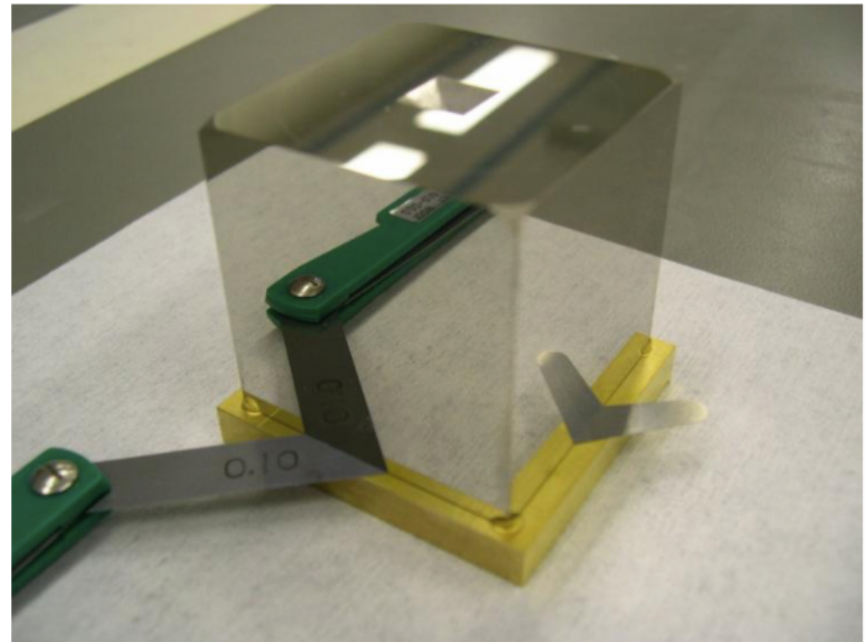
Simplified scheme of the constellation:



## LISA

### Test masses:

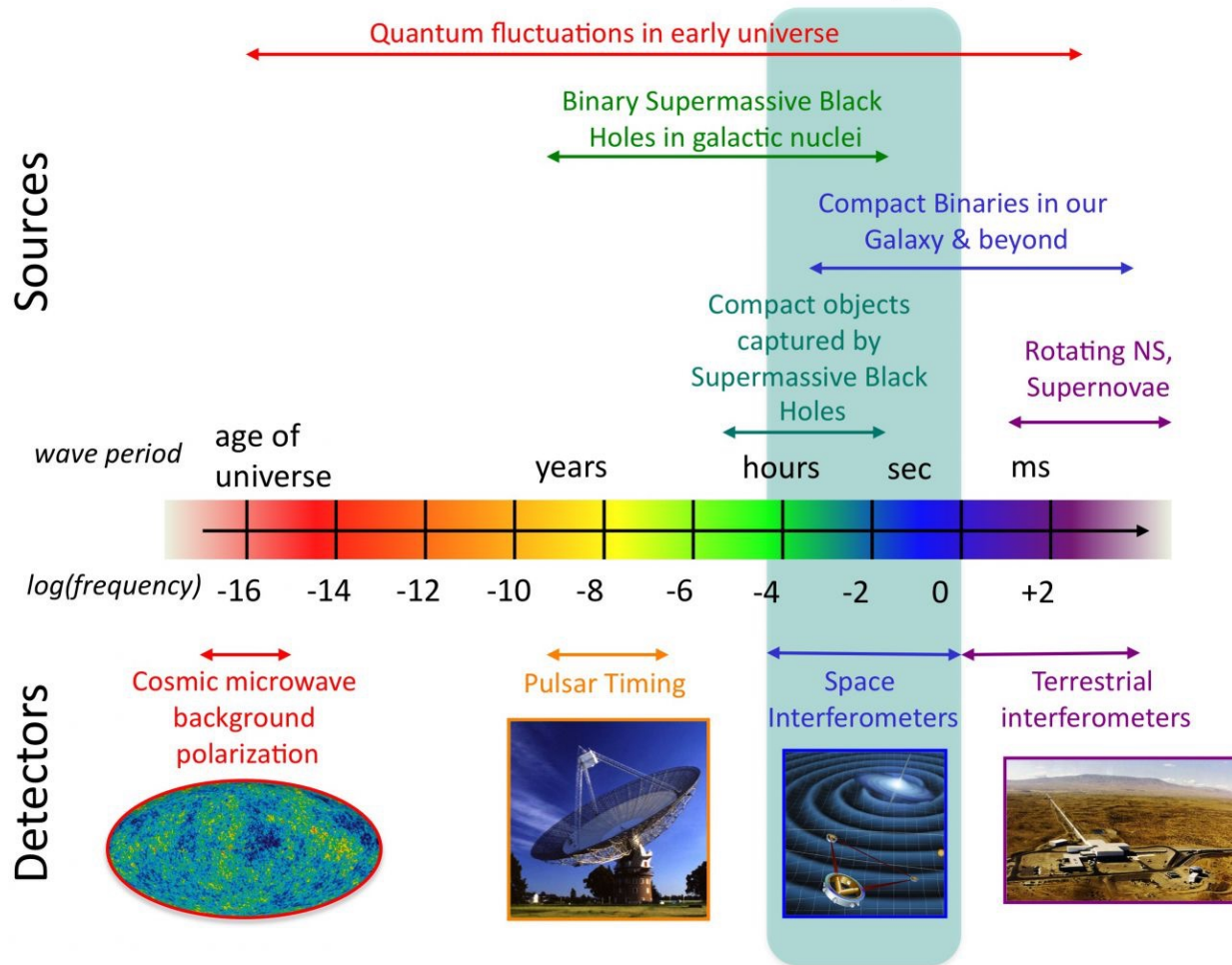
- Only affected by gravitation (free-fall)
- Used as a position reference by the satellites
- Lisa-Pathfinder has demonstrated the technology



One of the test masses of LISA Pathfinder

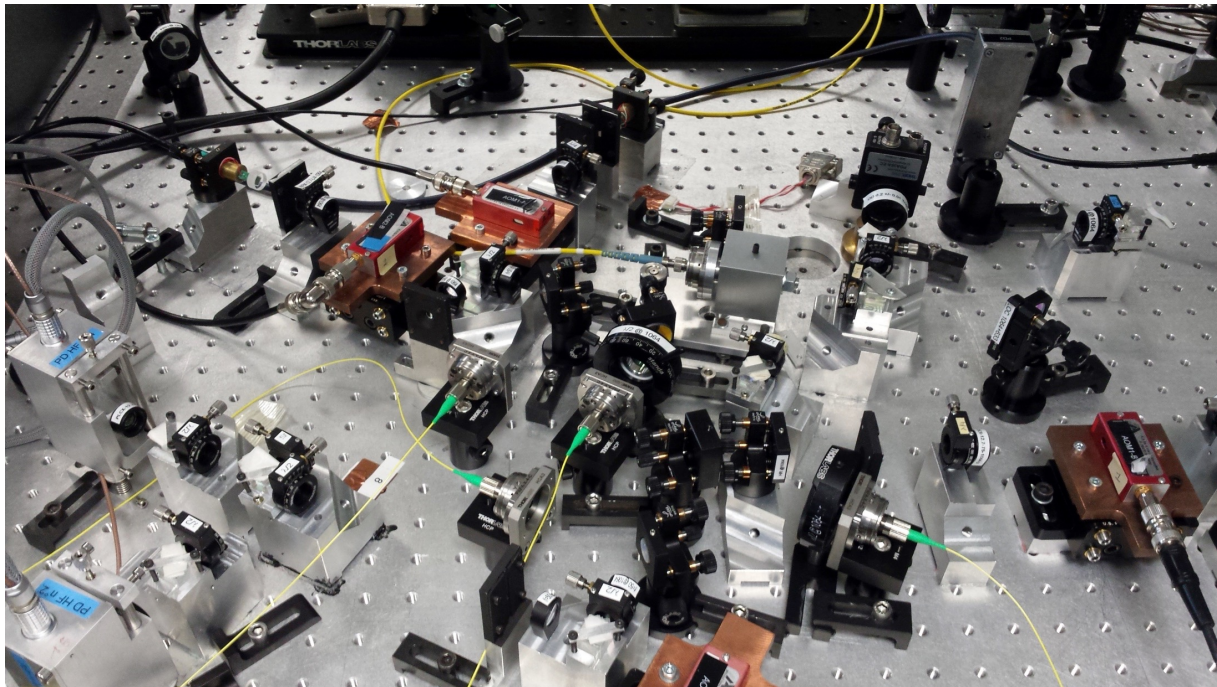
LISA

# The Gravitational Wave Spectrum

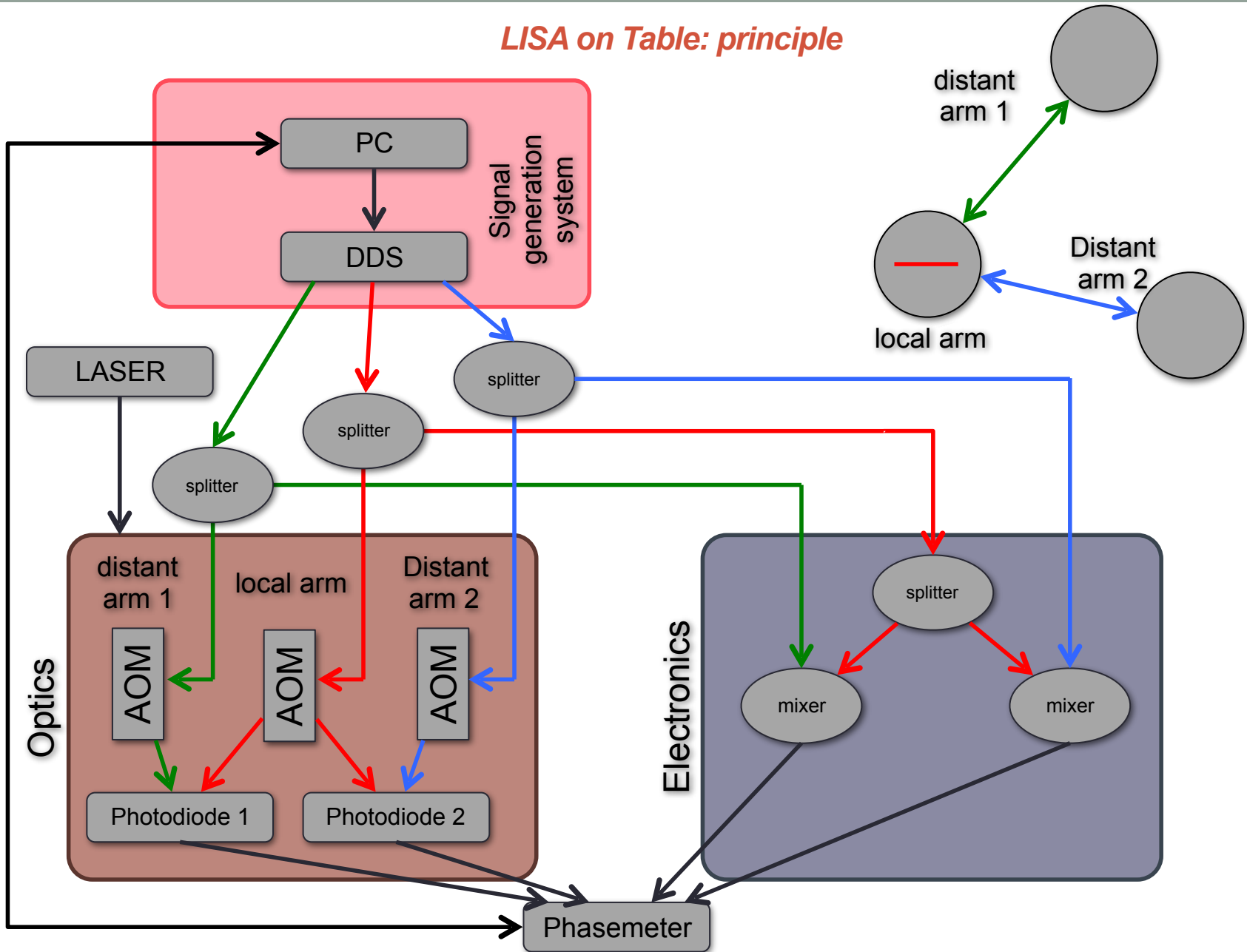


## *LISA on Table*

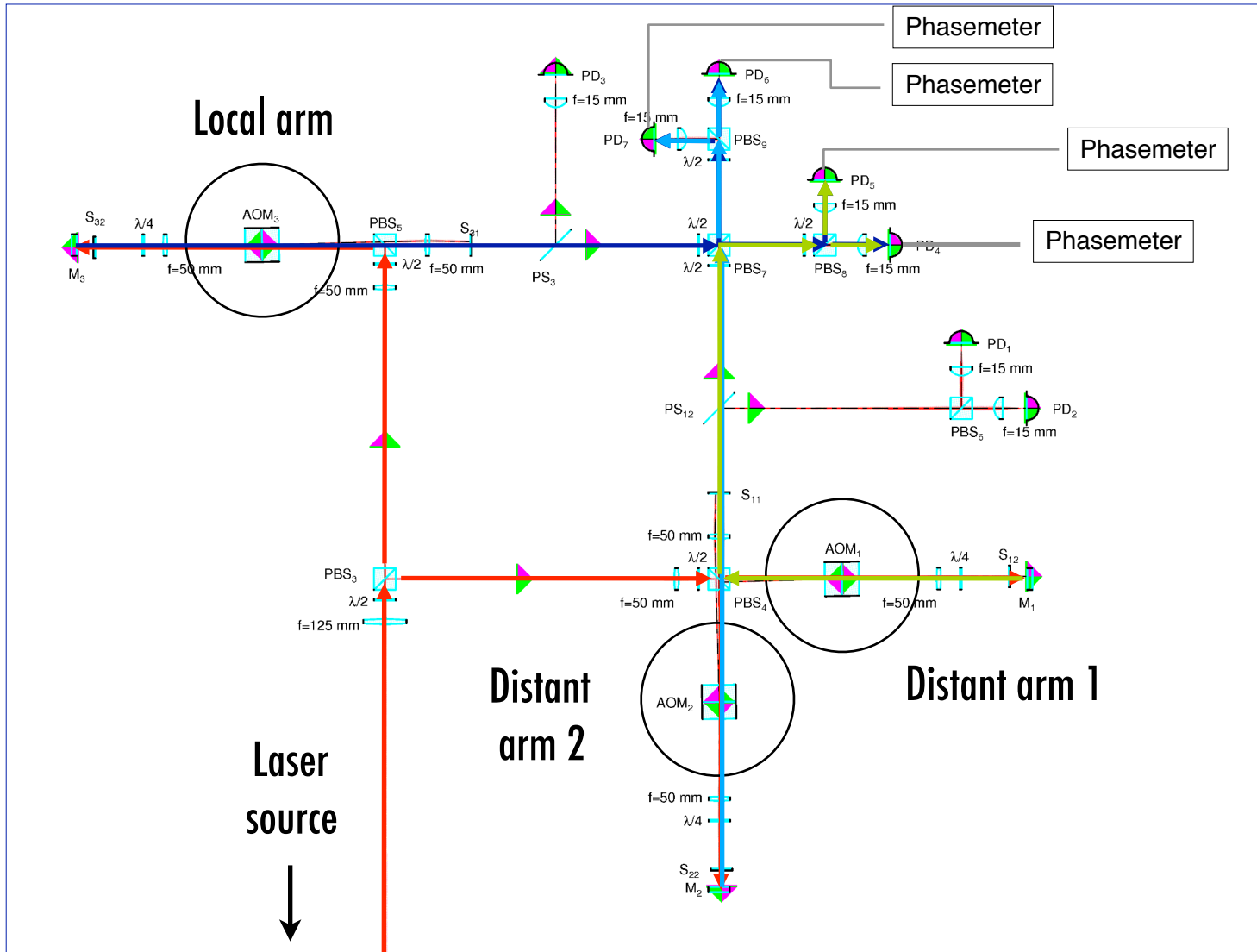
- Optical and electronic simulator of eLISA.
- Objectives: to test the noise reduction techniques experimentally, to test instruments (photodiodes, phasemeter, ...) in a representative acquisition chain.



*LISA on Table: principle*



*LISA on Table: optical layout*

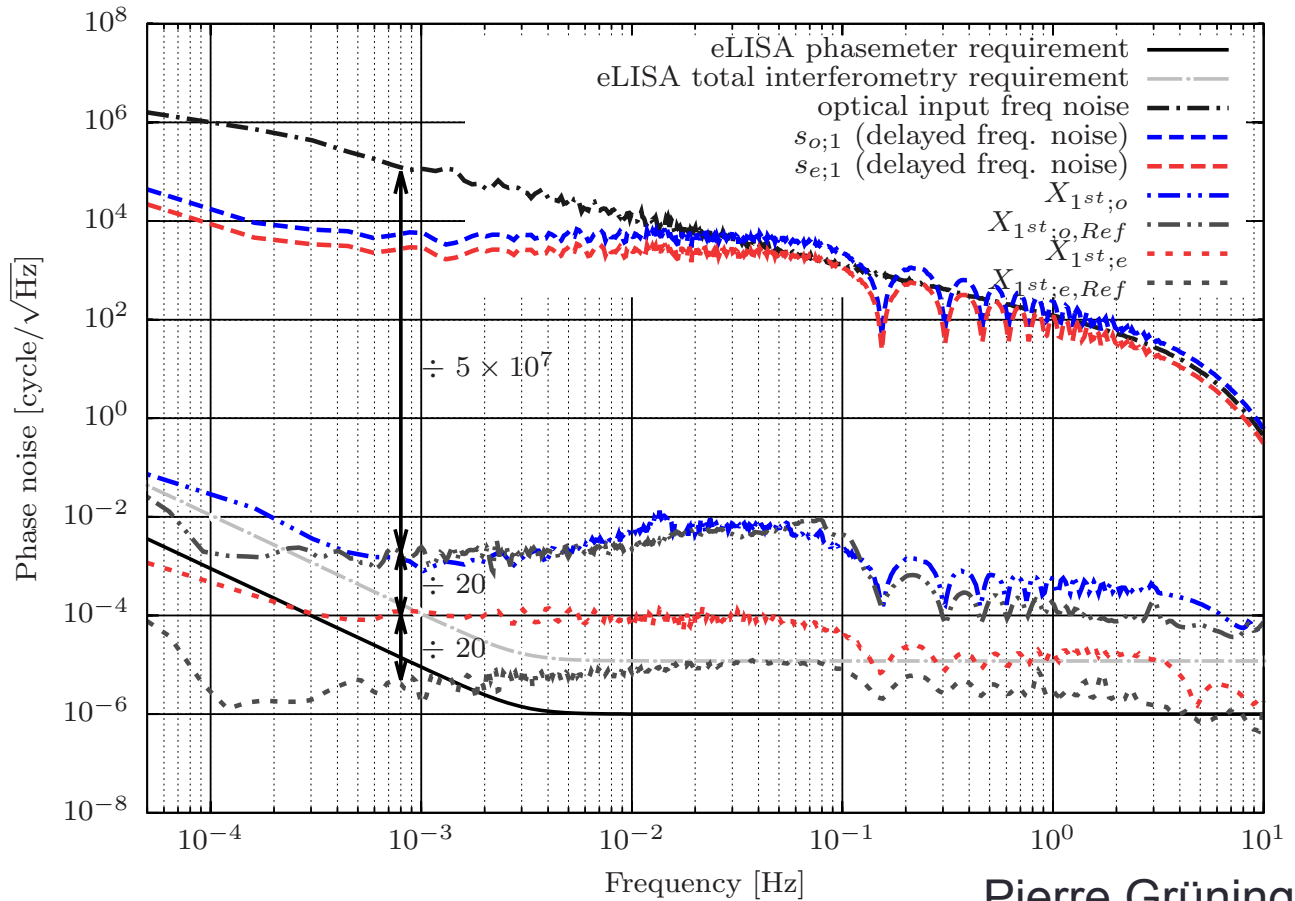




**LISA on Table: latest results**

Latest results for both interferometers in the following configuration:

- TDI 1st generation,
- static, uneven arms,
- white noise.



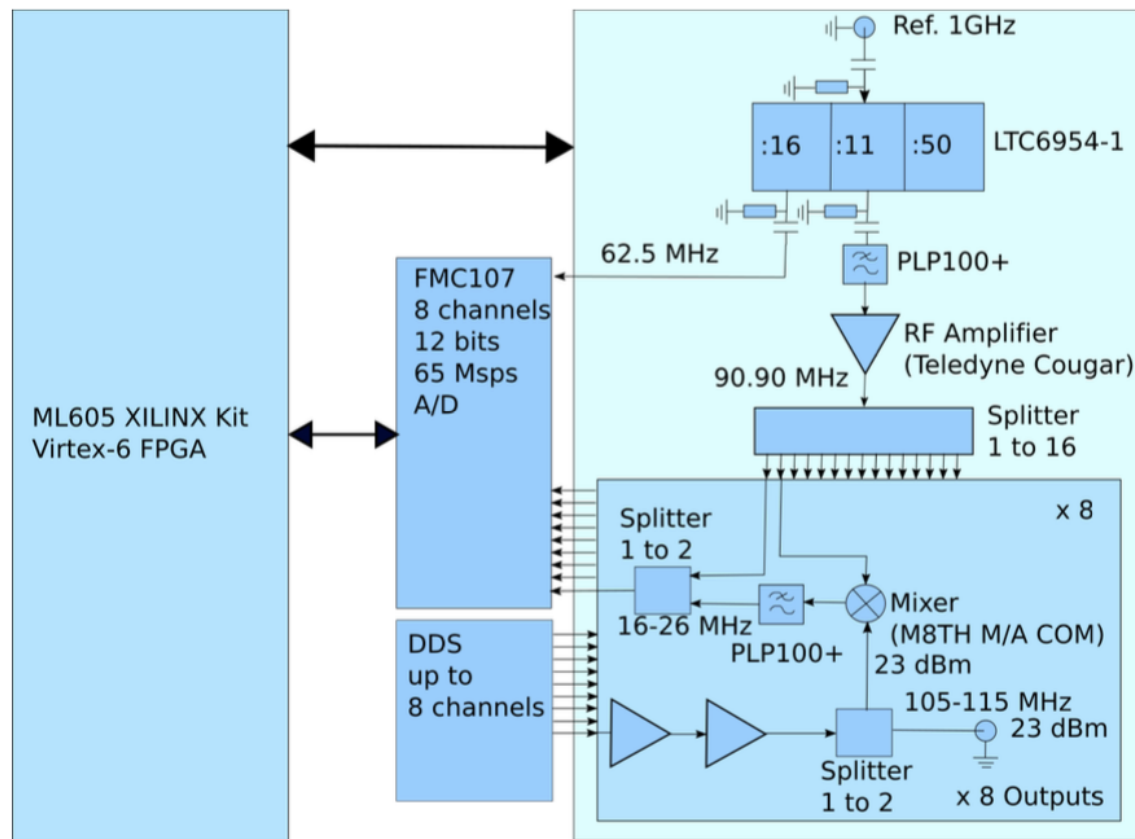
Pierre Grüning

*LISA on Table: limiting factors***Electronic interferometer:**

There is still a residual noise.  
It is probably due to jitter  
between  
the DDS channels.

**On-going work:**

Control loop on the DDS.

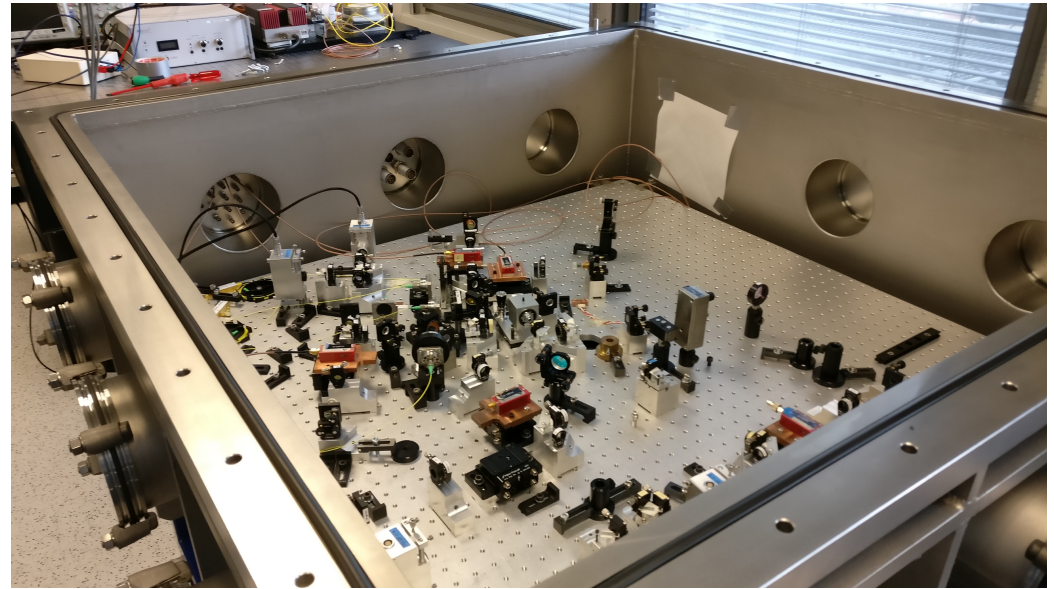


## *LISA on Table: limiting factors*

### **Optical interferometer:**

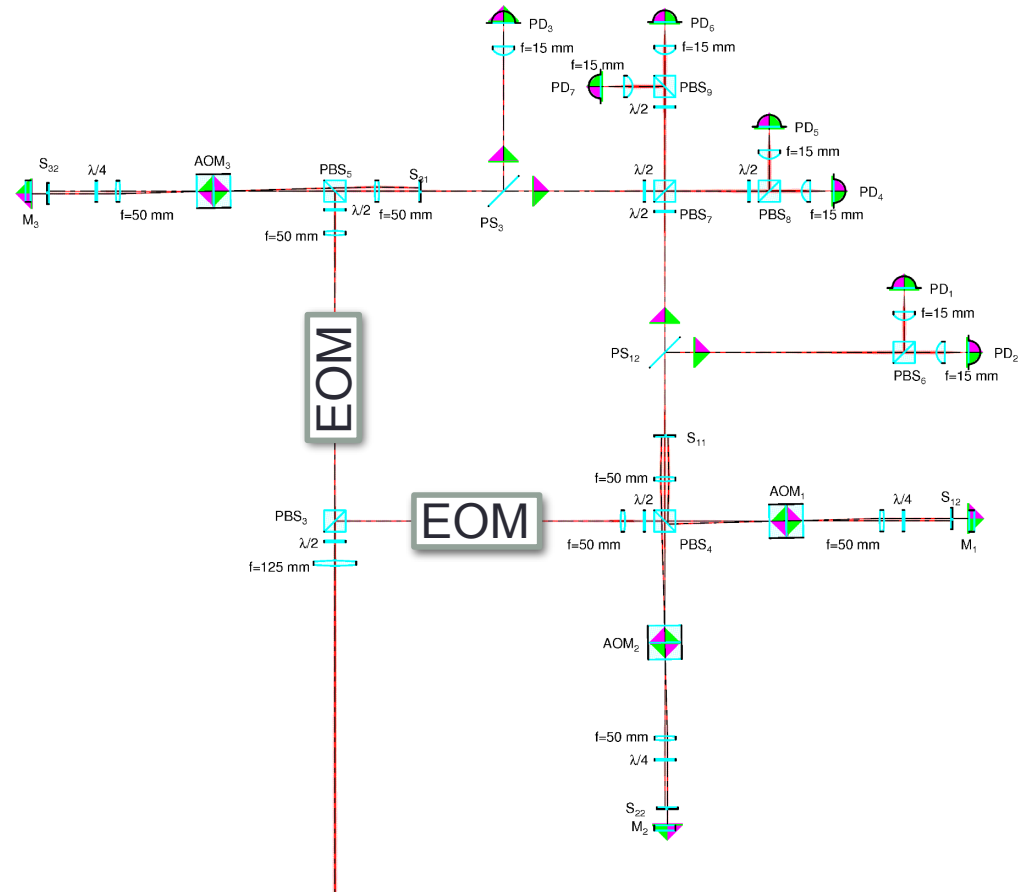
Only limited by the system, which means TDI works in this case.

**One must lower the optical noises of the system.**



## What has been done

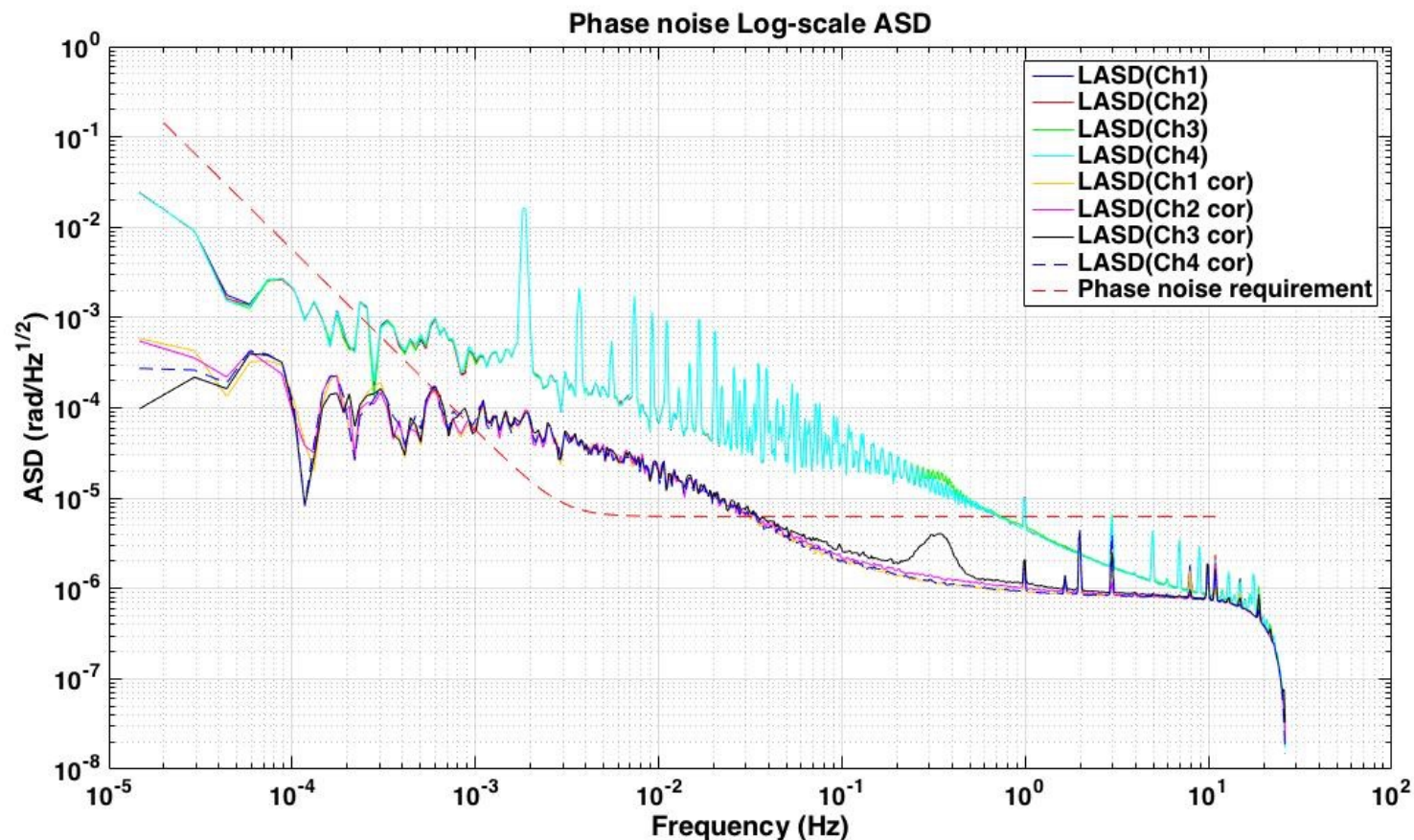
- Laser stability measurements
- Installation of EOM to simulate clock transfer noise
- Tests of an acquisition system
- Vacuum test of the chamber



## What has been done

Preparing the vacuum operation:

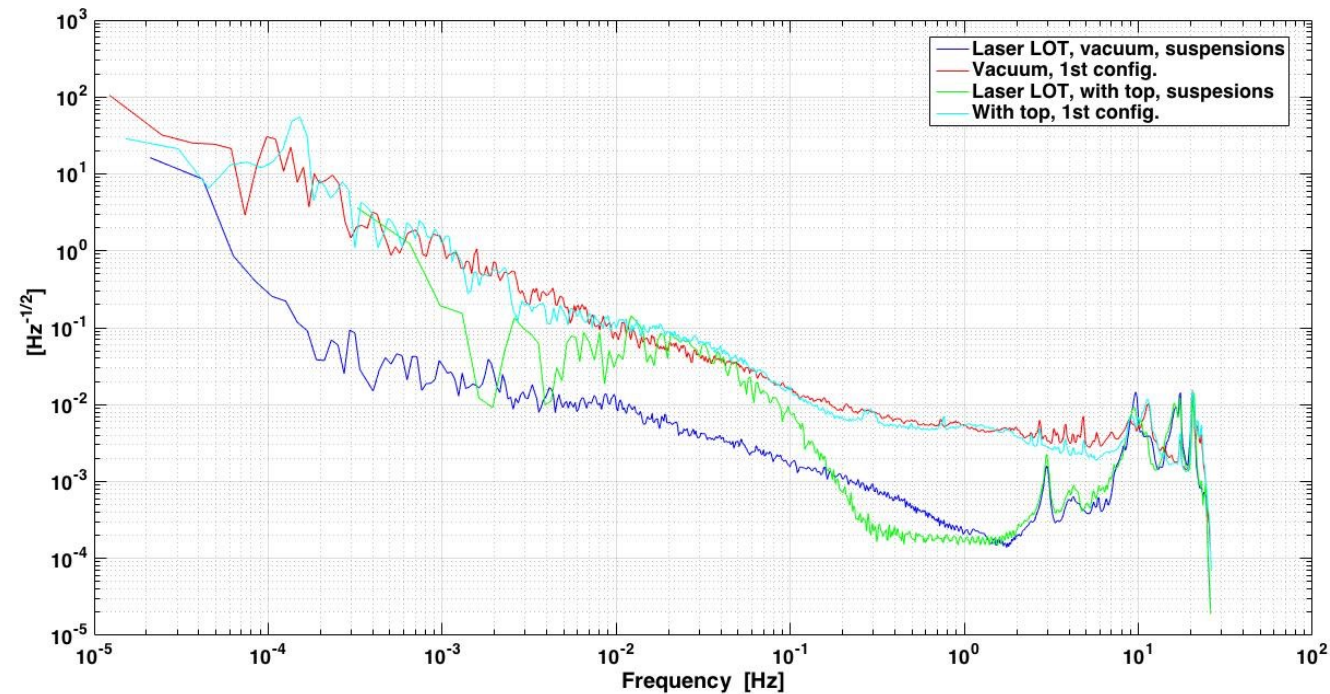
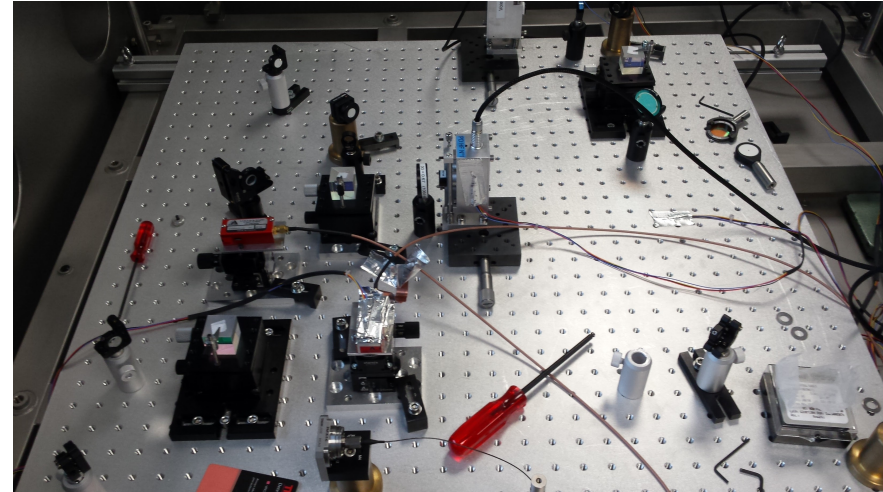
- New phasemeter tests:



## What has been done

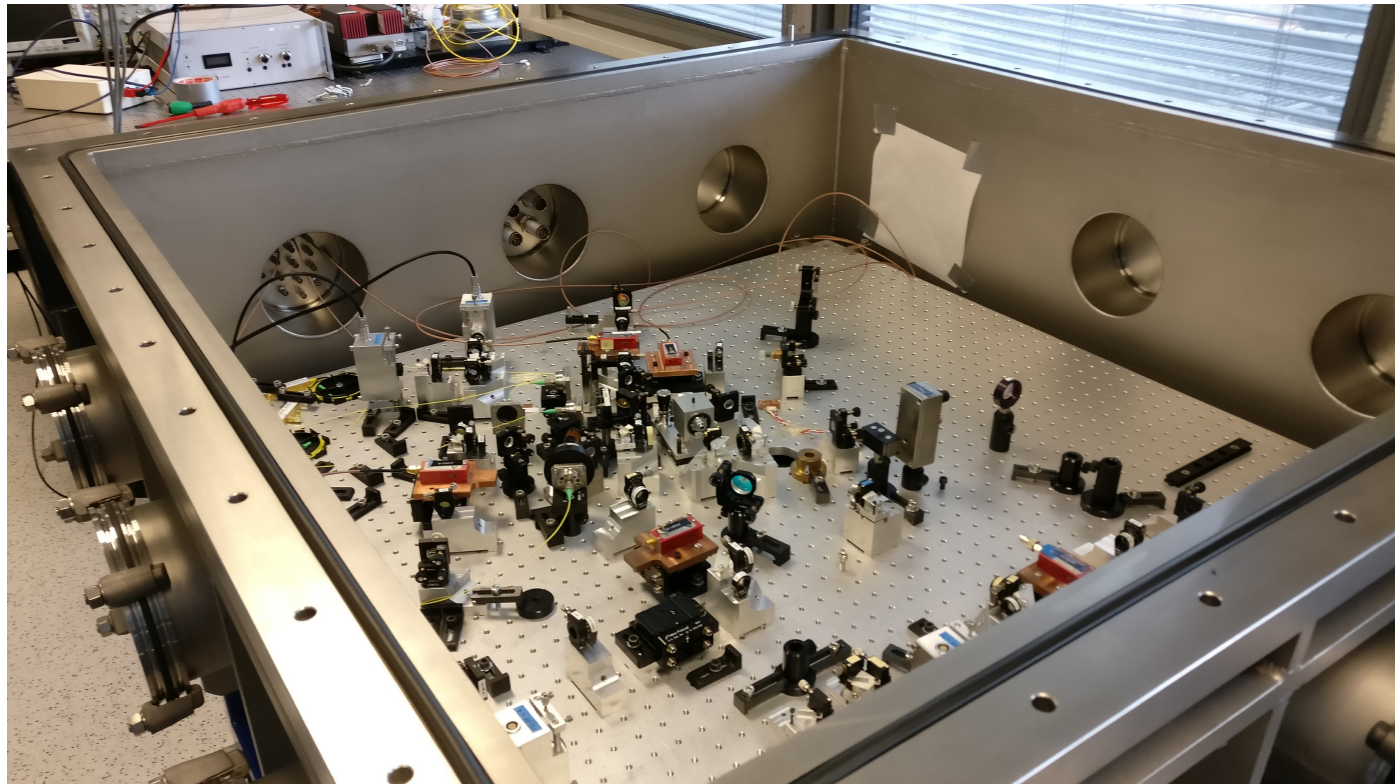
Preparing the vacuum operation:

- Tests with a small Mach-Zender interferometer



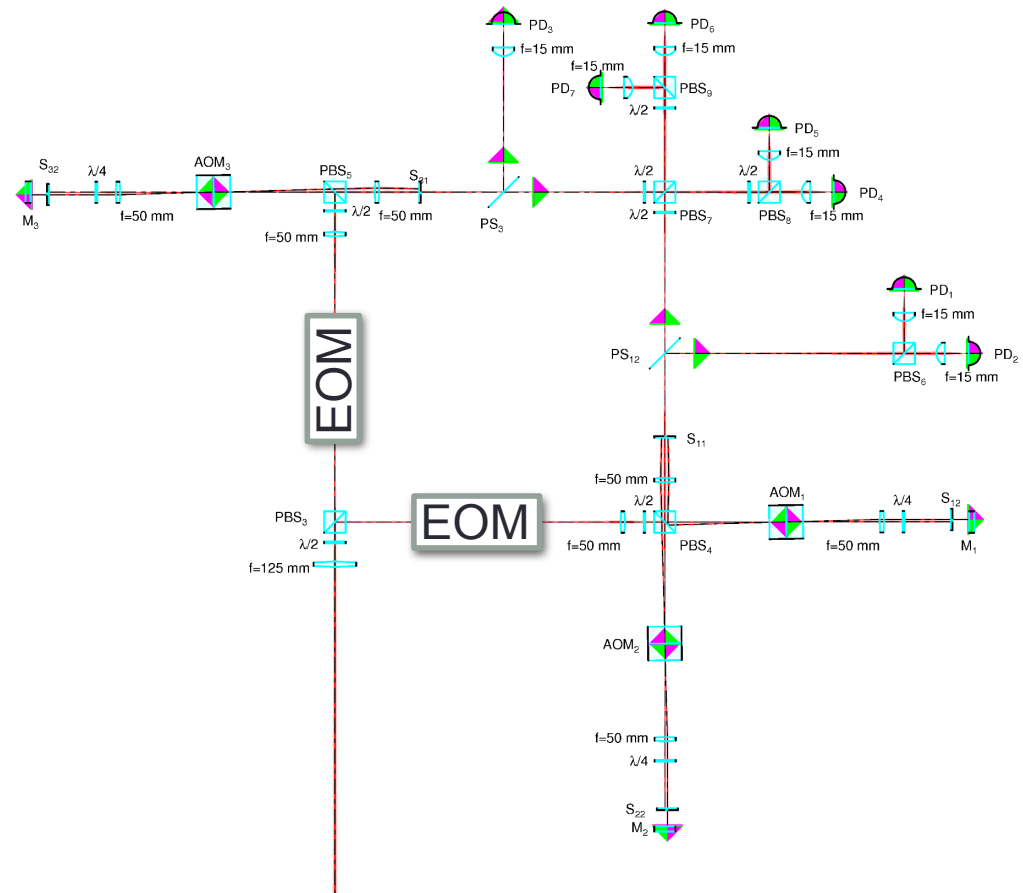
*What has been done*

**Installation Of the LOT  
in the vacuum chamber**



## LISA on Table: what next ?

- Operating the LOT in vacuum.
- New simulations:
  - A. Doppler effect
  - B. Clock noise transfers
- More effective active compensation





***Thank you!***